Development of UV/pyrolysis–GC/MS system incorporated with on-line micro-UV irradiation for rapid evaluation of photo and oxidative degradation of representative polymers under appropriate heating

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Abstract

A new pyrolysis–GC/MS system incorporating with on-line micro-ultraviolet (UV) irradiation was developed to make rapid evaluation of the synergistic material deterioration during UV irradiation (Xe lamp, wavelength: 280 - 450 nm) under oxidative atmospheres with appropriate heating. The basic effectiveness of the system was demonstrated by using polystyrene, polypropylene and polycarbonate as representative polymer samples. The volatile products evolved during deterioration of the polymers were analyzed on-line by thermal desorption GC/MS, and then the residual degraded polymers were analyzed by evolved gas analysis (EGA/MS) and/or Py–GC/MS to obtain specific thermograms and pyrograms. Based on these results, the deterioration mechanism of the polymeric materials during irradiation under oxidative atmosphere can be evaluated using a polymer sample on the order of sub-milligram within a relatively short period of time.

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